

Name: _____

Date: _____

PC: Composition of Functions

Two functions can be combined to form a new function.

Given: $f(x) = x^2 + 4$ and $g(x) = 2x$, then the composite function $f \circ g$, read “f following g,” can be defined by $[f \circ g](x) = f(g(x))$.

If we want to find $f(g(4))$, we can go about it two ways:

First way:

Since $g(4) =$ then $f(g(4)) = f() =$

Therefore $f(g(4)) =$

Second way:

Since $g(x) = 3x$, then $f(g(x)) = f() =$

Now we can plug 4 into that rule so $f(g(4)) =$

Example 1: Using the functions given above find: (a) $g(f(x))$
(b) $g(f(4))$

Notice that $[f \circ g](x) \neq [g \circ f](x)$. Therefore, the operation of composition is not commutative.

Example 2:

Let $f(x) = 3x - 5$ and $g(x) = 2 - x^2$. Find:

(a) $[f \circ g](0)$

(b) $g(f(0))$

(c) $[f \circ f](4)$

(d) $[g \circ g](3)$

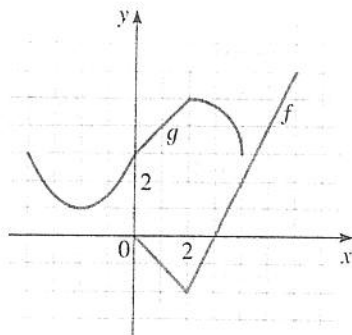
(e) $f(g(-2))$

(f) $g(f(x))$

(g) $(f \circ g)(x)$

Practice:

For 1-6, use the given graphs of f and g to evaluate the expression.



1. $f(g(2))$
2. $g(f(0))$
3. $(g \circ f)(4)$
4. $(f \circ g)(4)$
5. $(g \circ g)(-2)$
6. $(f \circ f)(4)$

7. For each of the following, find the functions $(f \circ g)(x)$ and $(g \circ f)(x)$.

(a) $f(x) = 2x + 3$, $g(x) = 4x - 1$

(b) $f(x) = 6x - 5$, $g(x) = \frac{x}{2}$

(c) $f(x) = x^3 + 2$, $g(x) = \sqrt[3]{x}$

(d) $f(x) = x^2$, $g(x) = \sqrt{x-3}$

(e) $f(x) = x^2$, $g(x) = x - 1$

8. Find $f(g(h(x)))$

(a) $f(x) = x - 1$, $g(x) = \sqrt{x}$, $h(x) = x - 1$

(b) $f(x) = \frac{1}{x}$, $g(x) = x^3$, $h(x) = x^2 + 2$

(c) $f(x) = x^4 + 1$, $g(x) = x - 5$, $h(x) = \sqrt{x}$

(d) $f(x) = \sqrt{x}$, $g(x) = \frac{x}{x-1}$, $h(x) = \sqrt[3]{x}$